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APPLICATION FOR UNITED STATES PATENT

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Title:	**REBAR SUPPORT CHAIR**
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SPECIFICATION

REBAR SUPPORT CHAIR

Background of the Invention

Field of the Invention

The present invention relates generally to chairs and spacers that are used in construction activities for the support of steel reinforcement members within concrete structures, and in particular to a stackable chair that reliably retains reinforcement bars, post-tension cables, rods, and the like

Description of the Related Art

Chairs or spacers are commonly used in the construction industry for the support and positioning of steel reinforcement members such as post-tension cables and/or reinforcement bars ("rebar") a proper distance above a surface. The rebar is usually arranged in rows or grids within an area into which concrete is to be poured, and are held loosely in place while concrete is placed around them. In normal use, a receiving area formed on the chair will contact and support the rebar while the base of the chair rests on a deck or on a grade.

Proper spacing and arrangement of steel reinforcement members in concrete slabs according to known engineering and architectural specifications impacts the structural strength and integrity of the concrete structure. Such steel reinforcement requires sufficient cover to avoid exposing the steel to the effects of moisture-penetrating corrosion. Once the steel is exposed to the effects of chemical-laden moisture, corrosion starts taking effect.

Known prior art chairs have desirable features which provide the proper support of rebar or post-tension cables safely within a concrete structure. Some chairs also have additional desirable features. For example, U.S. Patent No. 5,729,949 to Hartzheim discloses a readily stackable chair with a hollow-conical body that minimizes the amount of shipping and storage space required. These chairs have support legs with apertures between them to allow concrete to flow into the hollow interior of the chair. A worker can carry many chairs at one time and place numerous chairs at a construction site without repeated trips to a storage area.

U.S. Patent No. 6,089,522 to Haslem et al. discloses a stackable high chair having a lower base portion, an upper connecting portion and an upper support surface. The upper support surface includes bisecting cross members which join opposing corners of the upper support surface. Inclined ramps extend upwardly from the support surface and serve to position the rebar along the upper surface. The upper support surface also includes a plurality of holes which allows a head piece to be mounted to the chair, thereby allowing the height of the chair to be readily adjusted.

While the prior art chairs described above may be useful for their respective, particular objectives, a need exists for a stackable chair that is tall enough to

support rebar a significant distance above a surface, yet has a simple and strong construction.

Summary of the Invention

Accordingly, one objective of the present invention is to provide a chair with a simple yet strong design that is tall enough to support rebar a significant distance above a surface. It is also an objective to provide a tall chair that is light in weight yet able to securely support rebar. Yet another objective of the invention is to provide a tall rebar support chair with a wide base that allows the chair to stand securely. It is a further objective of the present invention to provide a rebar support chair that can be stacked within another chair to provide a more efficient method for packaging, storage, and shipment. It is also an objective to provide a plastic chair made of durable, non-corrosive materials that is easy to manufacture and easy to use.

Briefly stated, these objectives are accomplished by a generally funnel-shaped support chair having a hollow body with an inner surface, an outer surface, a receiving area, and a base. The base defines a lower opening and is adapted to rest on a planar support surface. The receiving area is adapted to receive and support the rebar. The lower opening of the chair is larger than the receiving area, and the inner and outer surfaces are substantially complementary to each other to allow a plurality of chairs to be stacked within each other for storage and shipment. Additionally, the stacking feature allows a worker to carry a stack of chairs at the job site as he places them at desired locations.

In one embodiment of the invention, the receiving area includes a first and a second pair of curved notches, with the second pair being oriented ninety degrees from the first pair. The first pair of notches has a first depth, and the second pair of

notches has a second depth. In this embodiment, the first pair is deeper than the second pair, and the chair is thus able to support rebar at different heights and in perpendicular relationships to one another. The receiving area may optionally include a plurality of bridges. A bridge is a band of material that spans the distance within the body of the chair between each of the pairs of notches. The bridges can assist to further increase the supporting strength of the chair, and can connect the medial, lowest portions, or troughs, of the notches.

In accordance with one aspect of the invention, the base includes a plurality of support legs which define a plurality of apertures, and the apertures allow poured concrete to pass fluidly through the chair. The apertures are preferably arch-shaped, and the support legs preferably have a thickened band of material around the apertures, such that the strength of the chair is reinforced by these thickened areas to allow the support legs to be longer yet retain their strength. In one embodiment, the base has four support legs, with two of the support legs further including foot members extending horizontally outwardly therefrom, the other two support legs lacking a foot member. In this embodiment, the foot members extend from support legs which are diametrically opposed from one another.

In another embodiment of the invention, the base includes upper and lower support legs. The lower support legs are the primary set of legs and are larger than the upper support legs. The receiving area is supported by both the upper and lower support legs, with the upper legs extending downwardly from the receiving area, and the lower support legs extending downwardly from the upper support legs. In one embodiment, the upper legs can include upwardly extending ribs on their outer surface. These ribs extend along each of the upper support legs between the junction of the lower

and upper legs. In this embodiment, the chair can be made to be significantly taller than other chairs of the prior art, and also be light in weight yet strong enough to support rebar securely, and without collapsing under the weight of the rebar. Preferably the chair is advantageously manufactured as a single piece of material, such that the chair can have the height and strength of a chair having a head piece seated on top of a base chair, yet be a single, tall chair with two sets of support legs.

In accordance with another aspect of the invention, the body of the chair has multiple substantially straight sides and a substantially square cross-section having rounded corners, with an inner surface that is complementary to the outer surface to allow a plurality of chairs to be stacked together, one inside the other, for storage and shipment. The chair may also have an elliptical, oval or hybrid cross-section. The chair preferably has a wide base which is adapted to rest on a flat support surface. The lower opening is defined by the base and is preferably larger than the upper receiving area, and the inner and outer surfaces are preferably substantially complementary to each other.

In accordance with another aspect of the invention, the receiving area and the base are integrally formed together from a durable, non-corrosive polymeric material. The chairs are easy to manufacture in this fashion, and packaging and storage of the chairs can be done quickly and easily because the chairs are also stackable. These and other aspects of the present invention will be more fully appreciated with respect to the following drawings and detailed description.

Brief Description of the Drawings

FIG. 1 is a perspective view of one embodiment of the chair of the present invention;

FIG. 2 is a perspective view of the chair of FIG. 1 in which rebar has been placed in the receiving area;

FIG. 3 is a perspective view of another embodiment of the chair of the present invention having two sets of support legs;

FIG. 4 is a perspective view of a plurality of chairs of Fig. 1 stacked within one another in accordance with one aspect of the invention; and

FIG. 5 is a perspective view of a plurality of chairs of FIG. 3 arranged in a stack.

Detailed Description of the Invention

Referring now to FIG. 1, a perspective view is shown of one embodiment of the chair 8 of the present invention having a hollow body 10 including a base 12, a receiving area 14, an inner surface 16, an outer surface 18, and ribs 20 formed on the outer surface for a purpose described below. The base 12 defines a lower opening 22 and is adapted to rest on a planar support surface. The receiving area 14 has a plurality of generally rounded notches 24, with elevated notch junctions 26 between adjacent notches. The lower base 12 has a plurality of separate support legs 32 extending downwardly from the receiving area 14. Foot members 34 extend radially outward from two opposing support legs 32. Adjacent support legs 32 define holes or apertures 36, which allow poured concrete to fluidly pass through the chair 8. The legs 32 have a thickened band of material 40 around each aperture 36.

The chair of FIG. 1 is preferably generally square in cross-section having rounded corners and is constructed of a single piece of resilient polymeric material. However, alternative embodiments of the chair may have a polygonal, elliptical, oval or hybrid cross-section. The receiving area 14 is adapted to receive and support concrete

reinforcement members, or rebar. The inner surface 16 is complementary to the outer surface 18, and the body 10 has multiple straight sides and is generally tapered, with the lower opening 22 being larger than the receiving area 14, thereby allowing multiple chairs to be stacked within one another for storage and shipment. The tapered shape of the chair also requires that the upper portion of the body 10, including the receiving area 14, is generally relatively narrow as compared to the lower portion, which includes the wider base 12. Ribs 20 function to space stacked chairs and facilitate their separation.

The apertures 36 between the support legs 32 are preferably arch-shaped and allow fluid concrete to pass through the body 10 beneath the level of the receiving area 14. The large openings provided by the apertures 36 maximize the free flow of concrete into and around chair 8. The support legs 32 preferably have a thickened band of material 40 around the apertures 36, such that the strength of the chair is reinforced by these thickened areas 40 to allow the support legs 32 to be longer yet retain their strength. As shown, the base 12 has four support legs 32, with two of the support legs further including foot members 34 extending horizontally outwardly therefrom, the other two support legs lacking a foot member. In FIG. 1, the foot members 34 extend from support legs 32 which are diametrically opposed from one another.

FIG. 2 shows reinforcement members 38 and 39 being supported by the chair 8 of FIG. 1. Reinforcement members 38 and 39 intersect with one another within the receiving area 14. The receiving area 14 includes a first and a second pair of curved notches, 24a and 24 b, respectively, with the second pair 24b being oriented ninety degrees from the first pair 24a. The notches 24a, 24b comprise curved bearing surfaces extending inwardly from outer surface 18. The first pair 24a are deep notches which receive rebar member 38, and the second pair of notches 24b are shallow notches which

receive rebar member 39, such that rebar member 39 is situated above and perpendicular to member 38 within the receiving area 14. The chair 8 is thus able to support rebar members 38 and 39 both at different heights and in perpendicular relationships to one another.

As a non-limiting example of how the reinforcement members 38 and 39 are placed within the chair 8, reinforcement member 38 is initially positioned over the receiving area 14 and then lowered into the deep notches 24a. Reinforcement member 39 is then lowered into the shallow pair of notches 24b. Notch pairs 24a are preferably deep enough to allow reinforcement member 38 to sit within the receiving area 14 while also allowing member 39 to sit completely within the shallow notch pairs 24b without interference from member 38.

FIG. 2 further illustrates the tapered shape of the chair 8. The upper portion of body 10 is narrow at the receiving area 14. The body 10 gradually widens from the notch junctions 26 down to the ends of the support legs 32. The lower opening 22 is therefore much larger in circumference than the receiving area 14. Also, each support leg 32 proceeds downwardly in a straight line from a junction 26. Preferably, two of the support legs 32 have a foot member 34 extending horizontally outwardly therefrom, adding further support to the base such that the base is well adapted to support the weight of the chair 8 as well as the reinforcement members 38, 39.

FIG. 3 illustrates another embodiment of the chair 108 in which the base 112 includes both lower 132 and upper 133 support legs. The lower support legs 132 are the primary set of legs and are larger and longer than the upper support legs 133. The receiving area 114 is supported by both the upper and lower support legs 132, 133, with the upper legs 133 extending downwardly from the receiving area 114 and defining

upper apertures 137, and the lower support legs 132 extending downwardly from the upper support legs 133 and defining lower apertures 136. A ledge 142 defines the junction between the upper 133 and lower 132 legs, and can be seen extending around the circumference of the body 110.

As shown in FIG. 3, the base 112 has four lower support legs 132, with two of the lower support legs 132 further including foot members 134 extending horizontally outwardly therefrom, the other two lower support legs lacking a foot member. The foot members 134 extend from diametrically opposed lower support legs 132. Upwardly extending ribs 120 are disposed on outer surface 118 and act as spacers to facilitate separation of stacked chairs, as described above with respect to ribs 20 of FIGS. 1 and 2.

The lower and upper apertures 136, 137 between the lower and upper support legs 132, 133, respectively, are preferably arch-shaped and allow fluid concrete to pass through the body 110 beneath the level of the receiving area 114. The large openings provided by the apertures 136, 137 maximize the free flow of concrete into and around chair 108. The lower support legs 132 preferably have a thickened band of material 140 around the lower apertures 136, such that the strength of the chair is reinforced by these thickened areas 140 to allow the lower support legs 132 to be longer yet retain their strength.

The receiving area 114 shown in FIG. 3, similar to the receiving area 14 in FIGS. 1 and 2, is adapted to receive and support concrete reinforcement members, or rebar. The inner surface 116 is complementary to the outer surface 118, and the body 110 has multiple straight sides and is generally tapered, with the lower opening 122 being larger than the receiving area 114, thereby allowing multiple chairs to be stacked

within one another for storage and shipment. Advantageously, the stackable chairs 108 facilitate handling on a job site, whereby workers may carry a stack of chairs 108 in one hand while placing individual chairs from the stack at desired locations at the job site.

The receiving area 114 of FIG. 3 further includes a plurality of bridges 128. A bridge junction 130 is formed where two bridges 128 meet in the center of the receiving area 114. The bridges 128, which are shown here but are an optional element of the chair 108, connect the medial, lowest portions, or troughs, of the notches 124, and span the distance within the body 110 of the chair between the notches 124. The bridges 128 assist to further increase the supporting strength of the chair 8. The bridges 128, which are optional, serve to support the rebar members 138 and 139 as they traverse the body 110 of the chair, and add strength and support to the structure.

Apertures are shown in FIGS. 1 through 3 as being generally arch-shaped, curved at the apex. One of skill in the art will recognize, however, that a variety of shapes, sizes, and numbers of apertures can be used. Support legs are generally of sufficient width and strength to support a substantial load, such as the force of the reinforcement members as well as the force applied by construction workers who may step or walk on the reinforcement members during the construction process. The thickened band of material around the apertures also adds strength to the structure, so that the chair does not collapse under such weight. Each foot member allows the base to rest on a flat, planar support surface, including loose or pliant surfaces such as dirt, sand, or the like.

As illustrated in FIG. 4, a plurality of chairs 8a and 8b can be stacked together, one inside the other, for packaging, storage and shipment. The combination of the tapered, generally funnel-like shape of chairs 8a and 8b, along with the

complementary surfaces, allows the upper receiving area of chair 8a to be inserted within the lower opening 22 of chair 8b, such that the outer surface 18a of the first chair slidably engages the inner surface of the second chair. The distance that a first chair is able to fit inside a second chair is dependant upon the degree of slope assumed by the surfaces 16 and 18 as the body 10 progresses from the receiving area 14 to the lower opening 22. That is, the smaller the receiving area is relative to the lower opening 22, the greater the slope will be of the surfaces 16 and 18. Preferably, this slope is sufficient to allow a substantial portion of the first chair to fit within the second chair, such that a great number of chairs can be stacked in a minimal amount of space without the stack becoming too tall or burdensome. As noted above, ribs 20 space stacked chairs and facilitate their separation.

As shown in FIG. 4, the chairs can be stacked with the foot members of one chair on opposite support legs as the foot members of the preceding chair, or alternatively the foot members can be on the same corresponding support leg, such that a user can recognize a specific corner of the chair. It will be apparent that the stacking capability allows a workman to carry a stack of chairs with one hand as he places chairs at the job site.

The chair of the present invention can be made significantly taller than most chairs of the prior art, and also is light in weight yet strong enough to support rebar securely, without collapsing under the weight of the rebar. Preferably the chair is advantageously manufactured as a single piece of material, and is constructed from a resilient polymeric material and, more specifically, is constructed of a plastic or resin material. In this manner, the chair can have the height and strength of a chair with a head piece seated on top of a base chair, yet be a single, tall chair with two sets of

support legs. Further, the chair is most preferably made of polypropylene and is one-piece injection molded. One of ordinary skill in the art will recognize that other materials exhibiting similar characteristics of being lightweight, strong and resilient can be used, such as polyethylene, a combination of polypropylene and polyethylene, and other known materials.

The present invention has been disclosed in detail in connection with the preferred embodiments. While there are many minor modifications that can be made without departing from the scope of the present invention, the present invention is defined by the claims that follow.

What is claimed is: